

# BARITE

By James P. Searls

The term "primary barite," as used in this report, refers to the first marketable product. This product includes crude barite, and the product of simple beneficiation methods such as washing, jigging, heavy media separation, tabling, flotation, and magnetic separation. Most primary barite requires grinding to a small, uniform size before it is used as a weighting agent in petroleum well drilling mud or as an addition to industrial products. This grinding was not usually performed at the mine site because railroad tariffs were higher for finished barite than for crude barite. There was some grinding of barite at the mine sites in Nevada to supply Western States, western Canadian provinces, and Alaska.

Barite is the mineralogical name for barium sulfate and was derived from the Greek word "barus," meaning heavy. In commerce, the mineral is sometimes referred to as "heavy spar" or "barytes." "Spar" means almost any transparent or translucent, readily cleavable, crystalline mineral having a vitreous luster.<sup>1</sup> One domestic barite producer has named its white technical grade barite as "baryte" to distinguish it from the petroleum well drilling [American Petroleum Institute (API) or Oil Companies' Materials Association (OCMA)] specification barite. Few mines in the United States produce a "spar" grade barite. Barite for petroleum well drilling, a weighting agent in the drilling mud, can be any color but must be only finely ground, dense, soft, and chemically inert. Barite for this purpose must have a specific gravity of 4.2 or greater, be free of soluble salts, and 90% to 95% of the material must pass through a 325-mesh screen. A small percentage of iron oxide is not allowable. Petroleum well drilling barite sales averages about 90% of total sales by processors, and it can be blue, black, brown, or gray depending on the ore body.

## Production

The quantity of primary barite sold or used by producers rose for a second year even though the data in table 1 does not reflect the fact. In 1993, data for run-of-mine barite were withheld to comply with regulations protecting company proprietary data. In 1994, there were more than three sellers, and a large increase of total sales and run-of-mine sales are reported. The 1994

level of total barite sales was above all preceding years since 1985 and equaled about 87% of 1985's total sales tonnage. (See table 2.)

Domestic sales data for barite were developed by the U.S. Bureau of Mines (USBM) from a voluntary survey of U.S. operations. Of the 37 operations to which a survey was sent, all reported, representing 100% of the primary barite, sold or used by producers. Of the 37 operations surveyed, there were 15 mines. One mine had closed during the year, 3 were idle, and 11 were producing. There were 22 grinding plants that were surveyed; 2 had closed, 1 was idle, and 19 were operating. (See table 3.) M-I Drilling Fluids' Clipper Mine was closed in 1994 owing to lack of demand. In 1993 and 1994, Baroid's Lakes Mine, Standard Slag's P&S Mine, and Milpark's Miller Mine were idle. M-I Drilling Fluids' New Orleans and West Lake grinding plants were closed in 1994. In 1993 American Minerals' Grinding Mill, Clark Minerals' Diana Mill, M-I's Brownsville plant, and Old Soldier's Elk City Mill were closed. In 1993 and 1994, Standard Magnesia's Fallon Mill was idle.

Dresser Industries, Inc. acquired Baroid Corp. in January. Dresser then was required by the Anti-Trust Division of the U.S. Department of Justice to sell within 6 months, and did sell, its 64% control of M-I Drilling Fluids Co. to Smith International Inc. The other holder of M-I Drilling Fluids Co., Haliburton Energy Services, retained its 36% ownership through the transaction.

Sales have risen from the 1992 low of 326,000 metric tons to 583,000 tons in 1994. More producers reported run-of-mine sales for 1994. Beneficiated product was 62% of total sales in 1994, while in 1992 the beneficiated product was 96% of total sales. The sales of industrial barite rose by 25% between 1993 and 1994 while the sales of barite for petroleum well weighting rose 14%. (See table 4.)

## Prices

The nominal average weighted price for sales of all barite by U.S. producers rose from \$37.21 per ton in 1990 to \$61.27 per ton in 1993 and dropped back to \$37.22 per ton in 1994. This variation in prices was due to the shift towards industrial barite by domestic

producers between 1990 and 1993 as low-cost, high-purity, but off-color Chinese and Indian barite became readily available. Demand for petroleum well weighting barite has been increasing over 1993 and 1994 owing to deep gas well drilling off the coast of Louisiana and Texas. Production and quality problems developed in late 1993 in both China and India, which resulted in reduced exports to the Gulf Coast. Prices for petroleum well weighting barite rose owing to imports into the Gulf States not rising as fast as demand, which allowed Nevada produced barite to return to the market. For 1994, the domestic producers supplied a broader range of barite quality, excluding only the United States Pharmacopoeia barite.

Nominal average prices for the crushed and ground barite rose from \$69.65 per ton in 1990 to \$84.48 per ton in 1992 and declined to \$62.26 per ton in 1994. International prices for the middle of the year from Industrial Minerals<sup>2</sup> were as follows: Uground, OCMA/API bulk, specific gravity 4.22, FOB Morocco, \$37-\$40 per ton; Ground, bagged, FOB Morocco, \$85 per ton; Ground OCMA bulk, delivered Aberdeen, \$69.30-\$80.09 (£45-£52)<sup>3</sup> per ton; and Micronised, off white minimum 99% < 20 microns delivered UK, \$215.60-\$231 (£140-£150) per ton.

## Consumption

The consumption of industrial barite is not well reported to the USBM. Crushers and grinders report only a division of sales between petroleum well weighting barite and "industrial" barite. No subdivisions of industrial end uses are reported because they are less than approximately 20,000 tons per year.

In 1994, barite demand showed little or no correspondence to the traditional indicators, such as oil price, gas price, increased well drilling, or drilling deeper wells. For the yearend 1994, the week-average futures price for light sweet crude oil had risen by 18.1% to \$17.07 per barrel<sup>4</sup> (bbl) relative to \$14.45 per bbl at yearend 1993. At midyear, the price was \$18.00 per bbl<sup>5</sup> so there was a strong increase in the first half of the year, followed by a significant decrease in the second half of the year. But there were fewer drill rigs directed towards oil prospects or locations in the middle of the year. The natural gas futures price moved

in the opposite direction by falling from \$2.04 per million British Thermal Units (BTU) to \$1.59 per million BTU's, about a 22.1% decrease, on the same basis. The number of gas directed rigs was essentially constant at about 420 rigs through the year,<sup>6</sup> while the number of oil directed rigs went from about 385 rigs at the beginning of 1994 to about 350 rigs at yearend.

Since wells, both oil and gas, start to encounter significantly higher pressures when deeper than about 3,135 meters (m) [7,000 feet (ft)] there should be an increase in barite consumption as more deep wells are drilled. However, wells completed deeper than 1,524 m (5,000 ft) in 1994, decreased 3% from 1993. But the average depth of exploratory and development wells drilled and completed, reported and estimated, according to the API,<sup>7</sup> increased 10% in 1994 from 1,625 m in 1993. Total completed gas wells declined from 9,693 wells, averaging 1,820 m in 1993, to 8,079 wells, averaging 1,890 m, in 1994. These factors would predict a decrease in sales of petroleum well weighting barite, yet sales increased from the previous year. Whatever drove barite consumption in 1994 may not affect the demand again and 1994 may be a high point of barite demand. (See tables 5, 6, 7, and 8.)

## Outlook

Barite is not likely to increase greatly beyond its present sales level and could decline, given all the negative trends in the 1994 well drilling statistics from the oil and gas industry. Much of the exploratory and development drilling has moved away from the United States owing to the lack of potential large discoveries and the environmental concerns. Barite is found around the world and is not shipped great distances, except by water, because of its relatively high density and low value. If the gas prices in the United States keep dropping, the chances of profits, given the possibilities of dry wells and successes, may become too low to pay back the cost of drilling. Also, the number of large, deep, undiscovered gas reserves, both onshore and offshore, is unpredictable but likely to decline.

<sup>5</sup>———. V. 92, No. 28, July 11, 1994, p. 3.

<sup>6</sup>———. V. 92 No. 2, Jan. 10, 1994, p. 66.

<sup>7</sup>American Petroleum Institute, Quarterly Completion Report-Fourth Quarter, 1994, V. X, No. 4, Jan, 1995. pp. 2-6.

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<sup>1</sup>A Dictionary of Mining, Mineral, and Related Terms, P. W. Thrush, Ed., U.S. Department of the Interior, U.S. GPO, Washington, DC, 1968, p. 1049.

<sup>2</sup>Industrial Minerals, (London), No. 322, July 1994, p. 68.

<sup>3</sup>International Monetary Fund, International Financial Statistics, End of June 1994, \$1.4484/SDR, £0.94038/SDR, Feb. 1995, p. 6.

<sup>4</sup>The Oil & Gas Journal, PennWell Publishing Co., Tulsa, OK, v. 93, No. 2, Jan. 9, 1995, p. 3.

TABLE 1  
SALIENT BARITE AND BARIUM CHEMICAL STATISTICS 1/ 2/

(Thousand metric tons and thousand dollars)

	1990	1991	1992	1993	1994
United States:					
Barite, primary:					
Sold or used by producers	430	448	326	315 3/	583
Value	\$16,000	\$21,300	\$19,600	\$19,300 3/	\$21,700
Exports	9	43	12	18	14
Value	\$1,680	\$3,300	\$1,810	\$2,610	\$1,850
Imports for consumption 4/	1,050 r/	887 r/	354 r/	804 r/	1,070
Value	\$46,300 r/	\$41,300 r/	\$17,300 r/	\$34,200 r/	\$47,200
Consumption (apparent) 5/	1,470 r/	1,290 r/	668 r/	1,100 r/	1,640
Crushed and ground (sold or used by processors) 6/	1,430	1,270	999	1,090 r/	1,250
Value	\$99,600	\$103,000	\$84,400	\$79,200 r/	\$81,100
World: Production	5,770 r/	5,470 r/	4,630 r/	4,080 r/	4,470 e/

e/ Estimated. r/ Revised.

1/ Previously published and 1994 data are rounded by the U. S. Bureau of Mines to three significant digits.

2/ Barium chemicals data withheld to avoid disclosing company proprietary data.

3/ Data excludes run of mine.

4/ Includes crude and ground.

5/ Sold or used plus imports minus exports.

6/ Includes imports.

TABLE 2  
U.S. PRIMARY BARITE SOLD OR USED BY PRODUCERS, BY STATE 1/

State	Number of operations	Run of mine		Beneficiated material 2/		Total	
		Quantity (thousand metric tons)	Value (thousands)	Quantity (thousand metric tons)	Value (thousands)	Quantity (thousand metric tons)	Value (thousands)
1993:							
Nevada	5	W	W	242	\$9,100	242 3/	\$9,100
Other States	5	--	--	73	10,200	73 3/	10,200
Total	10	W	W	315	19,300	315 3/	19,300
1994:							
Nevada	5	W	W	284	5,020	284 3/	5,020
Other States	6	W	W	77	10,800	77 3/	10,800
Total	11	222	\$5,930	361	15,800	583	21,700

W Withheld to avoid disclosing company proprietary data; included in "Total".

1/ Previously published and 1994 data are rounded by the U. S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Includes flotation concentrate.

3/ Data excludes run of mine.

TABLE 3  
CRUSHED AND GROUND BARITE SOLD OR USED BY PROCESSORS IN THE UNITED STATES,  
BY STATE 1/ 2/

State	1993			1994		
	Number of plants	Quantity (thousand metric tons)	Value (thousands)	Number of plants	Quantity (thousand metric tons)	Value (thousands)
Louisiana	7	534	\$37,000	5	676	\$51,700
Nevada	5 r/	212 r/	9,310 r/	4	308	7,220
Other 3/	13 r/	341	32,900	10	266	22,179
Total	25 r/	1,090 r/	79,200 r/	19	1,250	81,100

r/ Revised.

1/ Previously published and 1994 data are rounded by the U. S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Includes imports.

3/ Includes California, Georgia, Illinois, Missouri, New York (1994), Oklahoma (1993), Texas, and Utah.

TABLE 4  
CRUSHED AND GROUND BARITE SOLD OR USED BY PROCESSORS IN THE UNITED STATES, BY USE 1/ 2/

(Thousand metric tons and thousand dollars)

Use	1993		1994	
	Quantity	Value	Quantity	Value
Barium chemicals, filler and/or extender, glass	104	\$17,000	130	\$18,700
Well drilling	984 r/	62,200 r/	1,120	62,400
Total	1,090 r/	79,200 r/	1,250	81,100

r/ Revised.

1/ Previously published and 1994 data are rounded by the U. S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Includes imports.

TABLE 5  
U.S. EXPORTS OF NATURAL BARIUM SULFATE (BARITE), BY COUNTRY 1/

Country	1993		1994	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Argentina	--	--	19	\$3
Barbados	--	--	90	48
Canada	9,120	\$1,180	11,700	1,120
Dominican Republic	--	--	23	9
Honduras	3	3	--	--
Italy	14	3	28	14
Japan	118	604	43	207
Korea, Republic of	6	13	36	15
Mexico	1,040	262	1,870	408
Panama	150	20	--	--
Spain	20	65	--	--
Trinidad and Tobago	9	4	--	--
Tunisia	3	35	--	--
United Kingdom	2	4	19	19
Venezuela	8,000	412	--	--
Total	18,500	2,610	13,800	1,850

1/ Previously published and 1994 data are rounded by the U. S. Bureau of Mines to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 6  
U.S. IMPORTS FOR CONSUMPTION OF BARITE, BY COUNTRY 1/

Country	1993		1994	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
<b>Crude barite:</b>				
Canada	144	\$24	321	\$67
China	419,000	17,100	788,000	33,000
India	271,000	8,920	198,000	5,980
Mexico	36,000	1,370	2,390	217
Morocco	--	--	26,300	1,110
Switzerland	39,400	1,450	--	--
<b>Total</b>	<b>766,000</b>	<b>28,900</b>	<b>1,020,000</b>	<b>40,400</b>
<b>Ground barite:</b>				
Canada	10,200	2,730	11,600	2,730
Denmark	5	3	7	4
Germany	147	69	189	92
Japan	8	21	106	60
Mexico	27,400	2,460	46,600	3,920
Netherlands	24	12	2	3
<b>Total</b>	<b>37,800</b>	<b>5,290</b>	<b>58,500</b>	<b>6,810</b>

1/ Previously published and 1994 data are rounded by the U. S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ C.i.f. value.

Source: Bureau of the Census.

TABLE 7  
U.S. IMPORTS FOR CONSUMPTION OF BARIUM CHEMICALS 1/

Year	Barium choride		Barium oxide, hydroxide, and peroxide	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
1993	487	\$275	4,590	\$5,020
1994	510	264	4,240	4,640
	Barium nitrate		Barium carbonate, precipitated	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
1993	2,170	2,150	10,900	6,370
1994	2,800	2,510	18,700	10,600
	Other barium compounds			
	Quantity (metric tons)	Value 2/ (thousands)		
1993	12,200	10,700		
1994	13,000	11,400		

1/ Previously published and 1994 data are rounded by the U. S. Bureau of Mines to three significant digits.  
2/ C.i.f. value.

Source: Bureau of the Census.

TABLE 8  
BARITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country 3/	1990	1991	1992	1993	1994 e/
Afghanistan e/ 4/	2,000	2,000	2,000	2,000	2,000
Algeria	53,100	44,400	45,000	45,000 e/	45,000
Argentina	40,100 r/	23,900 r/	10,000 r/	11,300 r/	11,500
Australia e/	11,000	11,000	11,000	11,000	11,000
Belgium e/	35,000	35,000	30,000	30,000	30,000
Bolivia	300	1,280	368	-- e/	3,310 5/
Bosnia and Herzegovina e/ 6/ 7/	XX	XX	3,000	2,000	1,000
Brazil (beneficiated)	55,600	46,800	54,500	32,100 5/	45,000
Burma e/ 8/	9,470 5/	11,400 r/	136,000 r/	15,600 r/	16,000
Canada	41,000	50,000	37,000	59,000	55,000 5/
Chile	3,040	3,180	2,510 r/	2,040 r/	2,400
China e/	1,750,000	1,600,000 r/	1,500,000 r/	1,500,000 r/	1,500,000
Colombia	5,380	9,290	9,380	4,840 r/	7,000
Croatia e/ 7/	XX	XX	1,500	1,500	1,000
Czechoslovakia 9/	88,000	86,000 e/	31,300	XX	XX
Egypt	6,200	5,940	5,900 e/	5,900 e/	5,900
France	92,500	90,000 e/	96,200	67,200 r/	70,000
Georgia e/	XX	XX	40,000	30,000	20,000
Germany:					
Eastern states	61,400	XX	XX	XX	XX
Western states	148,000 r/	XX	XX	XX	XX
Total	209,000 r/	164,000	157,000	131,000 r/	135,000
Greece (crude ore)	1,620	1,310	1,000 e/	1,000 e/	1,000
Guatemala	421	--	1,720 r/	1,500 e/	1,000
India	633,000	615,000	458,000 r/	507,000 r/	510,000
Iran 4/	77,400	191,000	181,000	105,000 r/	100,000
Ireland	101,000	94,300	70,600	53,000 r/ e/	60,000
Italy	44,300	88,500	74,900	52,000 r/ e/	60,000
Kazakhstan e/	XX	XX	200,000	200,000	150,000
Kenya e/	105 5/	100	100	100	100
Korea, Republic of	2,920	1,010	40	50 e/	50
Malaysia	48,300	16,600	10,500	11,600 r/	17,100
Mexico	306,000	192,000	188,000	136,000 r/	150,000
Morocco	364,000	433,000	401,000	325,000	265,000 5/
Pakistan	23,300	28,800	32,400	26,300 r/	25,000
Peru	130,000 e/	150,000	16,600	16,600 e/	17,000
Philippines e/	500	500	500	500	500
Poland	25,300	18,300	15,700	16,000 r/	16,000
Portugal e/	1,220	1,000 r/	378 r/ 5/	350 r/	300
Romania e/	65,000	70,000	118,000 5/	115,000	105,000 5/
Slovakia e/	XX	XX	XX	30,000	25,000
South Africa, Republic of	2,490	4,790	3,570	2,000 r/	1,800 5/
Spain e/	11,300 5/	9,000	10,000	6,000 r/	5,000
Thailand	108,000	93,000 r/	46,300	42,400 r/	49,200
Tunisia	30,900	22,400	30,200	30,000 e/	30,000
Turkey (runofmine)	367,000	251,000	311,000	121,000 r/	140,000
U.S.S.R. e/ 10/	500,000	450,000	XX	XX	XX
United Kingdom	67,600	85,500	76,700	32,600 r/	40,000
United States 11/	430,000	448,000	326,000	315,000	758,000 5/
Yugoslavia 6/ 7/ 12/	23,600	20,000 e/	XX	XX	XX
Zimbabwe	320	866	232	120 r/	120
Total	5,770,000 r/	5,470,000 r/	4,630,000 r/	4,080,000 r/	4,470,000

e/ Estimated. r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Table includes data available through June 6, 1995.

3/ In addition to the countries listed, Bulgaria also produces barite, but available information is inadequate to make reliable estimates of output levels.

4/ Data are for fiscal year beginning Mar. 21 of that stated.

5/ Reported figure.

6/ All production in Yugoslavia from 1990-91 came from Bosnia and Herzegovina.

7/ Barite concentrates.

8/ Data are for fiscal year beginning Apr. 1 of that stated.

9/ Dissolved Dec. 31, 1992. Production in Czechoslovakia from 1990-91 came from the Czech Republic and Slovakia; all production for 1992 came from Slovakia.

10/ Dissolved in Dec. 1991.

11/ Sold or used by producers.

12/ Dissolved in Apr. 1992.